First Half 2005 Semiannual Groundwater Monitoring and Remediation Progress Report

Former Tosco/Unocal Bulk Terminal #0201
Eureka, California
Site ID #1THU463

Prepared for:

ConocoPhillips Corporation

Consulting Engineers & Geologists, Inc.
812 W. Wabash
Eureka, CA 95501-2138
707-441-8855

July 2005
098179.305

CONSULTING ENGINEERS & GEOLOGISTS, INC.
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Reference: 098179.305

July 20, 2005

Ms. Kasey Ashley
California Regional Water Quality Control Board
North Coast Region
5550 Skylane Boulevard, Suite A
Santa Rosa, CA 95403

Subject: **First Half 2005 Semiannual Groundwater Monitoring and Remediation Progress Report, Former Tosco/Unocal Bulk Terminal #0201, Eureka, California; Site ID #1THU463**

Dear Ms. Ashley:

We have enclosed one copy of the subject report for your review.

We look forward to your response. Please call if you have any questions, or if we can help you in any way.

Sincerely,

SHN Consulting Engineers & Geologists, Inc.

Mike Foget, P.E.
Project Engineer
707-441-8855

MKF/ADM:ap:med
Enclosure: Report

copy w/o encl: HCDEH (cover letter only)
copy w/encl: Thomas Kosel, ConocoPhillips
Tom Potter, SECOR

Reference: 098179.305

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QA/QC:JJA__

Executive Summary

The reporting period for this ***First Half 2005 Semiannual Groundwater Monitoring and Remedial Progress Report*** is January 1, 2005 to June 24, 2005. Activities performed during the first half of 2005 included groundwater sampling in 22 monitoring wells and 12 extraction wells. Remedial measures were also conducted, including Separate Phase Hydrocarbons (SPH) removal from selected recovery wells and operation and monitoring of the Eastern and Western Biovent / Biosparge Systems. The DPE system was operated for 132 days during this reporting period, which relates to a 75% on-line percentage. DPE system shutdowns were due to high groundwater conditions and disruption in electrical and propane services, which account for the majority of the system downtime.

Groundwater Monitoring Results: The results of the first half of 2005 semiannual sampling effort indicated that the dissolved phase petroleum hydrocarbon contamination continues to primarily be in the vicinity of the extraction wells. Contamination by Halogenated Volatile Organic Compounds (HVOCs) continues to be confined to the vicinity of monitoring wells MW-4, MW-30, MW-31, and MW-32. Petroleum hydrocarbons were not detected in MW-29, indicating the hydrocarbon plume continues to be confined to the eastern portion of the facility and is not impacting Humboldt Bay. SPH continues to be in the vicinity of the eastern portion of the facility.

Remedial Activities: SPH recovery was conducted through semi-monthly extraction of MW-26, MW-27, and MW-28; and weekly extraction of EW-1 through EW-12. Approximately 1.3 million gallons of a SPH / groundwater mixture were removed from the 12 extraction wells, MW-26, MW-27, and MW-28 during the first half of 2005. To date, a cumulative total of approximately 8.3 million gallons of SPH / groundwater mixture have been removed. The western biovent / biosparge system has been operating in a pulsed mode and cycled between different zones during the first half of 2005. The eastern biovent / biosparge system has been operating in a continuous sparge mode during the first half of 2005.

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Abbreviations and Acronyms

cfm	cubic feet per minute
ºF	degrees Fahrenheit
ft/min	feet per minute
µg/L	micrograms per Liter
<	denotes a value that is "less than" the method reporting limit
>	greater than
mV	millivolt
ppm	parts per million
ppmV	parts per million by volume
psi	pounds per square inch
ug/L	micrograms per Liter
BGS	Below Ground Surface
BS-#	Biosparge Well-#
BTEX	Benzene, Toluene, Ethylbenzene, and total Xylenes
DCE	cis-1,2-dichloroethene
DCO_2	Dissolved Carbon Dioxide
DO	Dissolved Oxygen
DPE	Dual-Phase Extraction
EC	Electrical Conductivity
EPA	(U. S.) Environmental Protection Agency
EW-#	Extraction Well-#
GAC	Granular Activated Carbon
HVOC	Halogenated Volatile Organic Compound
LEL	Lower Explosive Limit
M&RP	Monitoring and Reporting Program
MSL	Mean Sea Level
MTBE	Methyl Tertiary-Butyl Ether
MW-#	Monitoring Well-#
NA	Not Analyzed
NCUAQMD	North Coast United Air Quality Management District
NM	Not Measured
ORP	Oxidation-Reduction Potential
PCE	Tetrachloroethene
PID	Photoionization Detector
RWQCB	California Regional Water Quality Control Board, North Coast Region
SHN	SHN Consulting Engineers & Geologists, Inc.
SOP	Standard Operating Procedures
SPH	Separate Phase Hydrocarbons
TCE	Trichloroethene
TPHD	Total Petroleum Hydrocarbons as Diesel
TPHG	Total Petroleum Hydrocarbons as Gasoline
TPHMO	Total Petroleum Hydrocarbons as Motor Oil
VC	Vinyl Chloride
VOC	Volatile Organic Compound

1.0 Introduction

This report presents the results of monitoring activities and interim remedial measures conducted during the first half of 2005 at the Eureka Bulk Terminal # 0201, located at 1200 Railroad Avenue in Eureka, California (Figure 1). Activities performed during this period included:

- semiannual groundwater monitoring and sampling,
- monitoring for Separate Phase Hydrocarbons (SPH),
- continuation of the SPH recovery and biosparge/biovent programs, and
- operation and maintenance of the dual-phase extraction (DPE) unit.

2.0 Objectives

The objectives of work conducted during this period were to monitor groundwater conditions to evaluate:

- the extent of hydrocarbon contamination,
- the extent of SPH contamination, and
- the extent of Halogenated Volatile Organic Compound (HVOC) contamination.

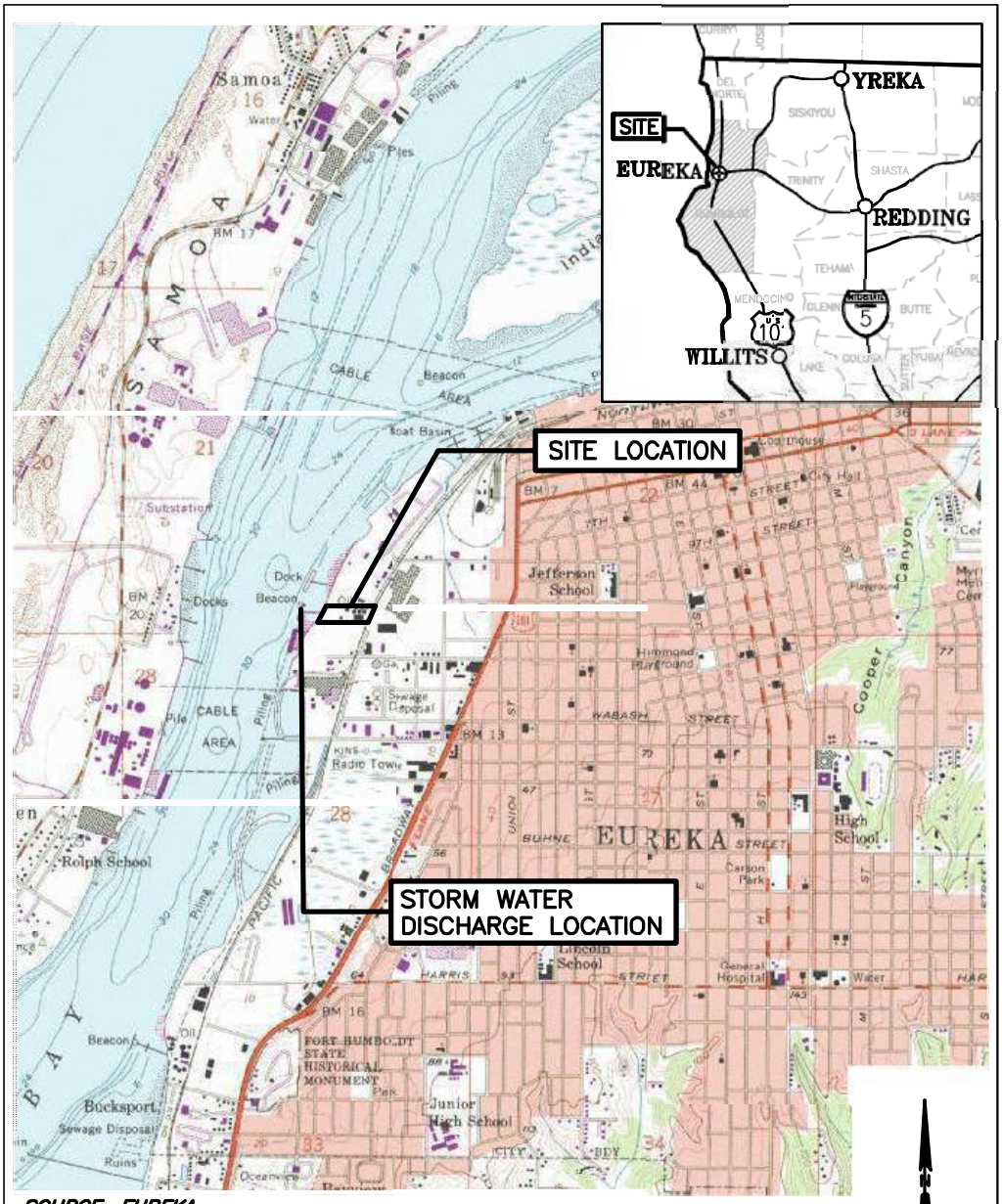
In addition, remedial measures were conducted, including SPH removal from selected recovery wells and continued operating, maintenance, and monitoring of the biovent and biosparge systems, as well as the DPE unit.

3.0 Groundwater Monitoring Program

3.1 Groundwater Monitoring Well Sampling

The California Regional Water Quality Control Board, North Coast Region (RWQCB) revised the site groundwater-monitoring program March 15, 2004. Groundwater monitoring was reduced for sampling parameters and frequency for some of the wells. Groundwater monitoring is performed in February and August. As part of the ongoing groundwater-monitoring program for the site, SHN Consulting Engineers & Geologists, Inc. (SHN) conducted site-monitoring activities from February 21–24, 2005, which included groundwater sampling from 23 monitoring wells and 12 extraction wells. All monitoring wells were measured for depth to water on February 21, 2005. A site map showing monitoring locations is presented as Figure 2.

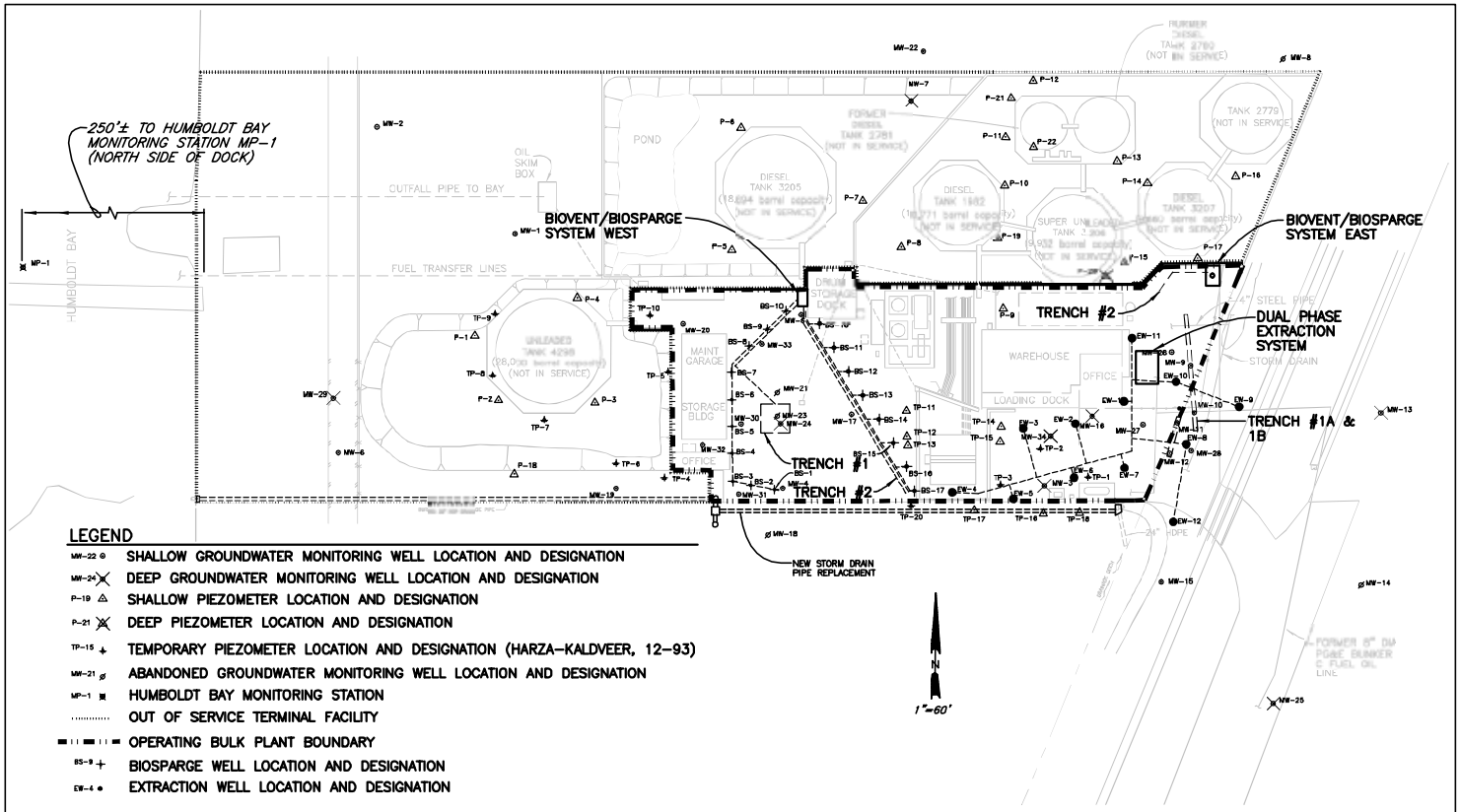
Groundwater monitoring was conducted in accordance with the RWQCB Monitoring and Reporting Program (M&RP) R1-2004-0022 for the first half of 2005. Monitoring of extraction wells is not required under M&RP R1-2004-0022, but is performed to measure the effectiveness of the DPE system. All groundwater monitoring and analyses were conducted in accordance with SHN's groundwater monitoring Standard Operating Procedures (SOP) for ConocoPhillips (Appendix A). Field notes and water quality sampling data sheets are located in Appendix B.



SOURCE: EUREKA USGS 7.5 MINUTE QUADRANGLE

1"=2000'±

Consulting Engineers & Geologists, Inc.	ConocoPhillips Eureka Bulk Plant #0201 Eureka, California	Site Location Map SHN 098179.305
	APRIL 2003	098179.305-LOCATION	Figure 1



LEGEND

- SHALLOW GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- DEEP GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- SHALLOW PIEZOMETER LOCATION AND DESIGNATION
- DEEP PIEZOMETER LOCATION AND DESIGNATION
- TEMPORARY PIEZOMETER LOCATION AND DESIGNATION (HARZA–KALDVEER, 12–93)
- ABANDONED GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- HUMBOLDT BAY MONITORING STATION
- OUT OF SERVICE TERMINAL FACILITY
- OPERATING BULK PLANT BOUNDARY
- BIOSPARGE WELL LOCATION AND DESIGNATION
- EXTRACTION WELL LOCATION AND DESIGNATION

SOURCE:
FIGURE MODIFIED FROM
DRAWING PROVIDED BY PEG.

SHN Consulting Engineers & Geologists, Inc.	Conocophillips Eureka Bulk Terminal #0201 Eureka, California	Site Plan SHN 098179.305
	MAY 2005	098179.305-SITEPLAN	Figure 2

3.2 Bioremediation Monitoring Program

The bioremediation indicators monitored during 1999 have shown that biodegradation of petroleum hydrocarbons and HVOCs is occurring at the site. Therefore, the monitoring program for indicators of bioremediation has been modified to semiannual monitoring only for field-measured parameters of dissolved oxygen, dissolved carbon dioxide, and oxidation/reduction potential. Monitoring for these field-measured parameters is scheduled for the first and third quarters of each year. Monitoring these parameters was conducted in accordance with SHN's groundwater monitoring SOP. The monitoring results are presented in Section 3.7.

3.3 Laboratory Analysis

Laboratory analysis of groundwater samples was conducted in accordance with SHN's groundwater monitoring SOP for ConocoPhillips. The complete laboratory analytical reports, quality assurance/quality control data, and corresponding chain-of-custody documentation are presented in Appendix C.

3.4 Site Hydrology

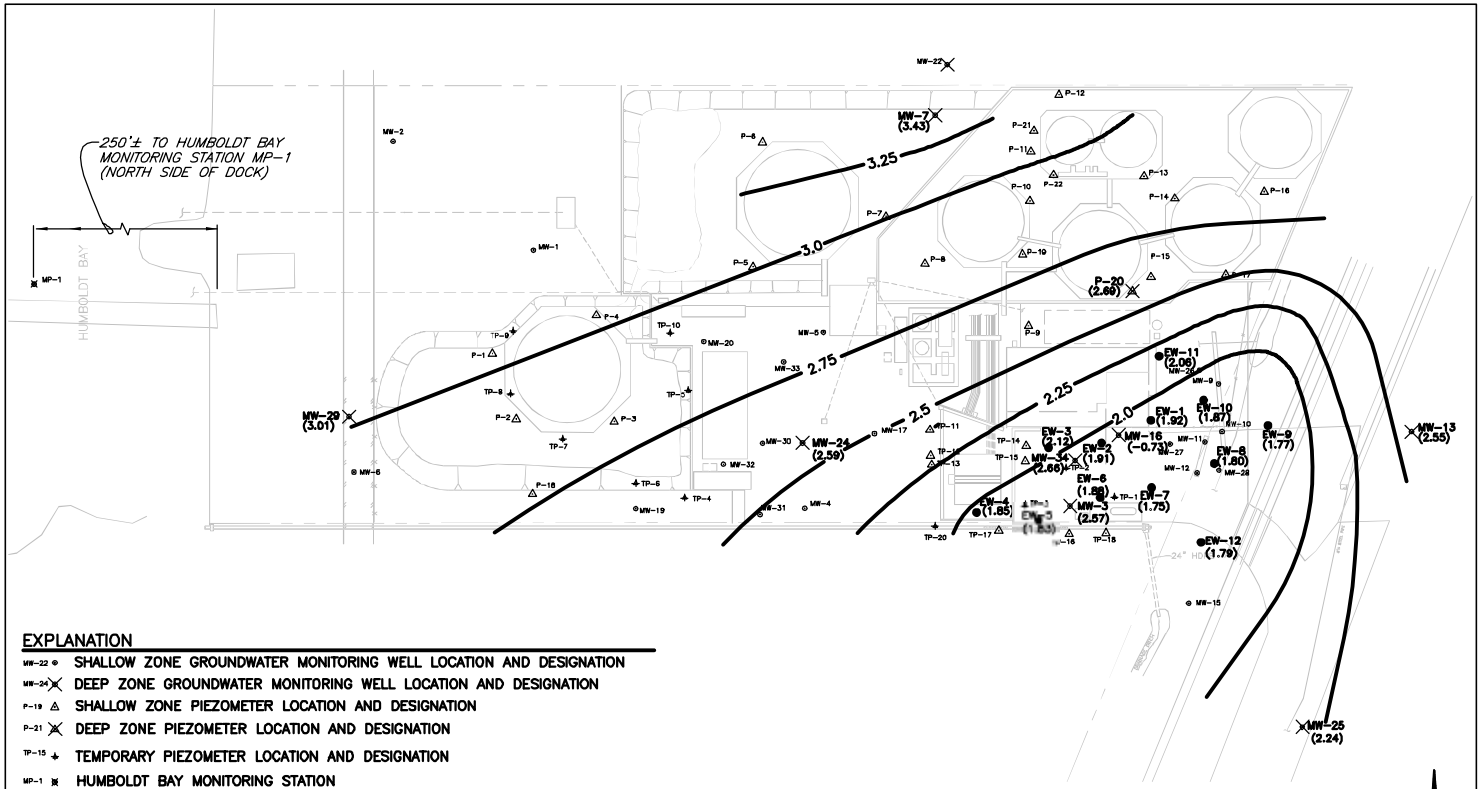
Historically, two water-bearing zones have been identified at the site. The first is a shallow water-bearing zone consisting of shallow fill and bay mud units, and the other is a deep water-bearing zone consisting of a bay sand unit.

Groundwater in the shallow water-bearing zone is perched within the fill and bay mud units, and there appear to be several localized influences on the shallow water-bearing zone. The discontinuity of the bay mud deposit beneath the site does not allow for accurate interpretation of the movement of groundwater within this perched water-bearing zone. Therefore, groundwater elevation data for the wells screened in the shallow zone are only presented in the historic groundwater elevation tables (Appendix D).

Historically, in the deep water-bearing zone, groundwater has moved from the northeast to the southwest across the site, in the expected direction of the regional groundwater flow. Groundwater flow direction and gradient varied on February 21, 2005, with a general flow direction to the southeast. An area of depressed groundwater elevation is present in the vicinity of the extraction wells.

A tidal study conducted by SHN in March 2000 indicated that regional groundwater flow beneath the site is affected, while perched zone groundwater is not affected by tidal fluctuations in Humboldt Bay. These changes in water level may act to retard movement of groundwater towards Humboldt Bay in the deep water-bearing zone. The rise in water levels in the deep water-bearing zone due to tidal influence would decrease the overall groundwater gradient, resulting in decreased groundwater flow towards Humboldt Bay (SHN, May 2000).

Groundwater elevation data for the deep water-bearing zone on February 21, 2005 are summarized in Table 1, and a groundwater elevation contour map is presented as Figure 3. Historic groundwater elevation data are located in Appendix D.



EXPLANATION

- MW-22 ⊗ SHALLOW ZONE GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- MW-24 ⊗ DEEP ZONE GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- P-19 △ SHALLOW ZONE PIEZOMETER LOCATION AND DESIGNATION
- P-21 ⊗ DEEP ZONE PIEZOMETER LOCATION AND DESIGNATION
- TP-15 + TEMPORARY PIEZOMETER LOCATION AND DESIGNATION
- MP-1 ⊠ HUMBOLDT BAY MONITORING STATION
- EW-4 ● EXTRACTION WELL LOCATION AND DESIGNATION
- (0.40) GROUNDWATER ELEVATION (FEET MSL)
- -0.3- GROUNDWATER CONTOUR (FEET MSL)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- (NM) NOT MEASURED

SOURCE:
FIGURE MODIFIED FROM DRAWING PROVIDED BY PEG.

NOTE: MW-34, MW-16 AND MW-3 NOT USED TO CREATE GROUNDWATER CONTOURS.

N

1"=60'

SHN Consulting Engineers & Geologists, Inc.	ConocoPhillips Eureka Bulk Plant #0201 Eureka, California	Groundwater Contours February 21, 2005 SHN 098179.305
	MAY 2005	098179.305-GWC-FEB-2005	Figure 3

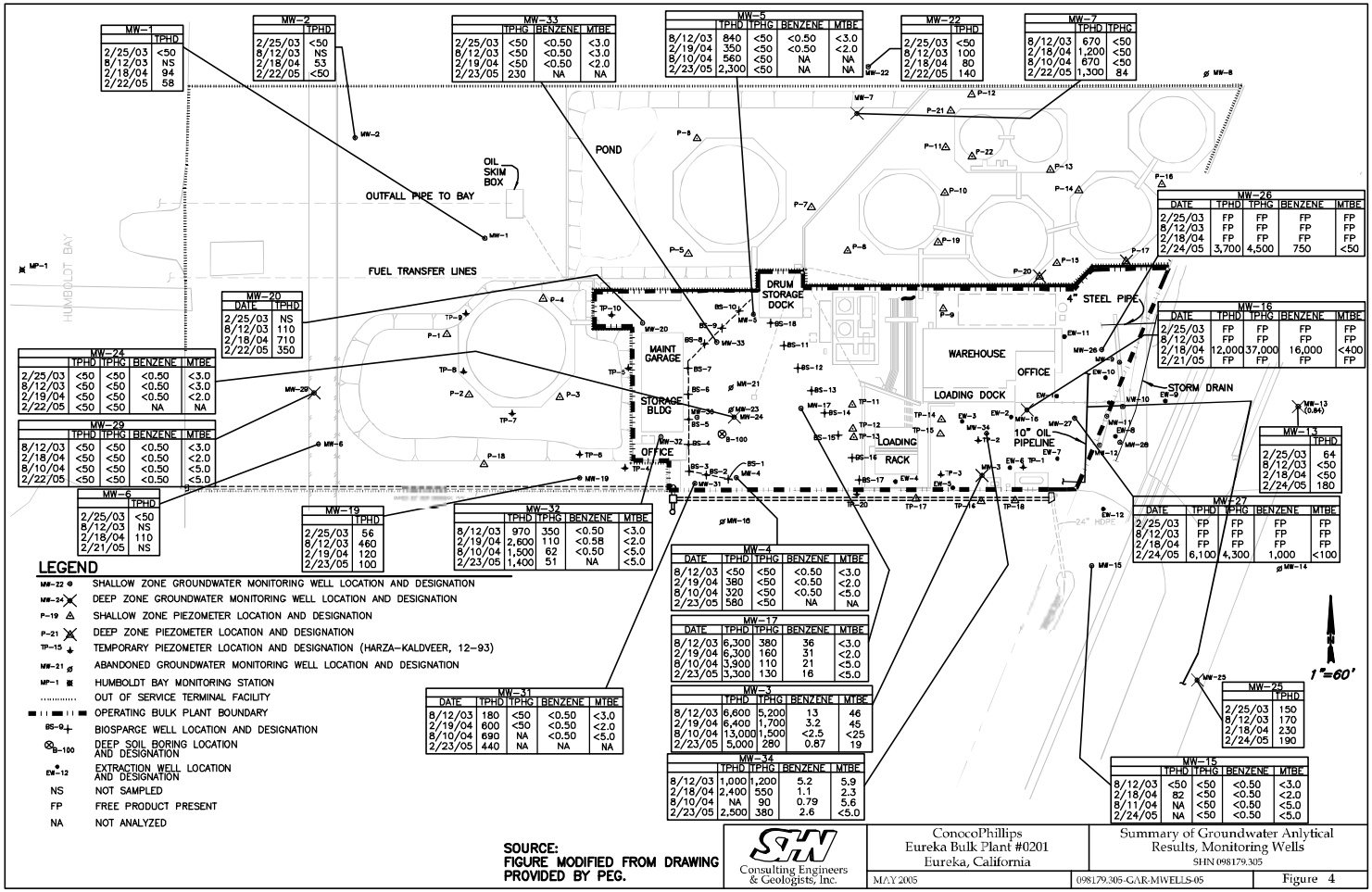
Table 1
Deep Zone Groundwater Elevation Data, February 21, 2005
Eureka Bulk Plant #0201

Well ID	Measuring Point Elevation[1] (feet MSL)	Depth to SPH[2] (feet)	SPH Thickness (feet)	Depth to Water[3] (feet)	Groundwater Elevation[4] (feet MSL)
MW-3	7.65	5.08	0.00	5.08	2.57
MW-7	7.99	4.56	0.00	4.56	3.43
MW-13	6.61	--	--	4.06	2.55
MW-16	7.42	8.13	0.15	8.28[5]	-0.73
MW-24	6.31	--	--	3.72	2.59
MW-25	6.11	--	--	3.87	2.24
MW-29	8.11	--	--	5.10	3.01
MW-34	7.56	4.90	0.00	4.90	2.66
P-20	8.77	--	--	6.08	2.69
EW-1	6.72	4.79	0.01	4.80	1.92
EW-2	6.97	5.06	0.00	5.06	1.91
EW-3	6.90	--	--	4.78	2.12
EW-4	6.65	--	--	4.80	1.85
EW-5	6.90	--	--	5.07	1.83
EW-6	6.83	--	--	4.95	1.88
EW-7	6.78	5.01	0.02	5.03	1.75
EW-8	6.73	--	--	4.93	1.80
EW-9	6.37	--	--	4.60	1.77
EW-10	6.93	5.04	0.02	5.06	1.87
EW-11	6.53	4.47	0.00	4.47	2.06
EW-12	6.76	4.97	0.00	4.97	1.79

1. Top of casing elevation, in feet above Mean Sea Level (MSL).
2. SPH: Separate Phase Hydrocarbons
3. Depth to water, in feet below top of casing
4. Groundwater elevation, in feet above MSL
5. Corrected for the presence of SPH. Density of SPH estimated at 0.85.

3.5 Petroleum Hydrocarbon Groundwater Monitoring Results

First half of 2005 groundwater-monitoring results for petroleum hydrocarbons are summarized in Table 2. Total Petroleum Hydrocarbons as Diesel (TPHD) and as Gasoline (TPHG), Benzene, and Methyl Tertiary-Butyl Ether (MTBE) results are shown on Figures 4 and 5. Historic analytical results for petroleum hydrocarbons are presented in Appendix D. The bulk of the dissolved phase contamination is in the vicinity of the extraction wells. Low concentrations of dissolved phase petroleum hydrocarbons were also detected in several other monitoring wells. Petroleum hydrocarbons were not detected in wells MW-2 or MW-29, indicating that petroleum hydrocarbon plumes continue to be confined to the eastern portion of the facility and are not impacting Humboldt Bay. The bulk of SPH hydrocarbon contamination remains in the eastern portion of the facility.


MW-1
TPHD
2/25/03 <50
8/12/03 NS
2/18/04 94
2/22/05 58
MW-2
TPHD
2/25/03 <50
8/12/03 NS
2/18/04 53
2/22/05 <50
MW-33
TPHG BENZENE MTBE
2/25/03 <50 <0.50 <3.0
8/12/03 <50 <0.50 <3.0
2/19/04 <50 <0.50 <2.0
2/23/05 230 NA NA
MW-5
TPHD TPHG BENZENE MTBE
8/12/03 840 <50 <0.50 <3.0
2/19/04 350 <50 <0.50 <2.0
8/10/04 560 <50 NA NA
2/23/05 2,300 <50 NA NA
MW-22
TPHD
2/25/03 <50
8/12/03 100
2/18/04 80
2/22/05 140
MW-7
TPHD TPHG
8/12/03 670 <50
2/18/04 1,200 <50
8/10/04 670 <50
2/22/05 1,300 84
MW-26
DATE TPHD TPHG BENZENE MTBE
2/25/03 FP FP FP FP
8/12/03 FP FP FP FP
2/18/04 FP FP FP FP
2/24/05 3,700 4,500 750 <50
MW-16
DATE TPHD TPHG BENZENE MTBE
2/25/03 FP FP FP FP
8/12/03 FP FP FP FP
2/18/04 12,000 37,000 16,000 <400
2/21/05 FP FP FP FP
MW-20
DATE TPHD
2/25/03 NS
8/12/03 110
2/18/04 710
2/22/05 350
MW-24
TPHD TPHG BENZENE MTBE
2/25/03 <50 <50 <0.50 <3.0
8/12/03 <50 <50 <0.50 <3.0
2/19/04 <50 <50 <0.50 <2.0
2/22/05 <50 <50 NA NA
MW-29
TPHD TPHG BENZENE MTBE
8/12/03 <50 <50 <0.50 <3.0
2/18/04 <50 <50 <0.50 <2.0
8/10/04 <50 <50 <0.50 <5.0
2/22/05 <50 <50 <0.50 <5.0
MW-6
TPHD
2/25/03 <50
8/12/03 NS
2/18/04 110
2/21/05 NS
MW-19
TPHD
2/25/03 56
8/12/03 460
2/19/04 120
2/23/05 100
MW-32
TPHD TPHG BENZENE MTBE
8/12/03 970 350 <0.50 <3.0
2/19/04 2,600 110 <0.58 <2.0
8/10/04 1,500 62 <0.50 <5.0
2/23/05 1,400 51 NA <5.0
MW-13
TPHD
2/25/03 64
8/12/03 <50
2/18/04 <50
2/24/05 180
MW-27
DATE TPHD TPHG BENZENE MTBE
2/25/03 FP FP FP FP
8/12/03 FP FP FP FP
2/18/04 FP FP FP FP
2/24/05 6,100 4,300 1,000 <100
MW-4
DATE TPHD TPHG BENZENE MTBE
8/12/03 <50 <50 <0.50 <3.0
2/19/04 380 <50 <0.50 <2.0
8/10/04 320 <50 <0.50 <5.0
2/23/05 580 <50 NA NA
MW-17
DATE TPHD TPHG BENZENE MTBE
8/12/03 6,300 380 36 <3.0
2/19/04 6,300 160 31 <2.0
8/10/04 3,900 110 21 <5.0
2/23/05 3,300 130 16 <5.0
MW-3
TPHD TPHG BENZENE MTBE
8/12/03 6,600 5,200 13 46
2/19/04 6,400 1,700 3.2 45
8/10/04 13,000 1,500 <2.5 <25
2/23/05 5,000 280 0.87 19
MW-31
DATE TPHD TPHG BENZENE MTBE
8/12/03 180 <50 <0.50 <3.0
2/19/04 600 <50 <0.50 <2.0
8/10/04 690 NA <0.50 <5.0
2/23/05 440 NA NA NA
MW-34
TPHD TPHG BENZENE MTBE
8/12/03 1,000 1,200 5.2 5.9
2/18/04 2,400 550 1.1 2.3
8/10/04 NA 90 0.79 5.6
2/23/05 2,500 380 2.6 <5.0
MW-25
TPHD
2/25/03 150
8/12/03 170
2/18/04 230
2/24/05 190
MW-15
TPHD TPHG BENZENE MTBE
8/12/03 <50 <50 <0.50 <3.0
2/18/04 82 <50 <0.50 <2.0
8/11/04 NA <50 <0.50 <5.0
2/24/05 NA <50 <0.50 <5.0
POND
OIL SKIM BOX
OUTFALL PIPE TO BAY
FUEL TRANSFER LINES
HUMBOLDT BAY
MAINT GARAGE
STORAGE BLDG
OFFICE
DRUM STORAGE DOCK
4" STEEL PIPE
WAREHOUSE
OFFICE
LOADING DOCK
STORM DRAIN
10" OIL PIPELINE
LOADING RACK
24" HDPE
1"=60'
LEGEND
SHALLOW ZONE GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
DEEP ZONE GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
SHALLOW ZONE PIEZOMETER LOCATION AND DESIGNATION
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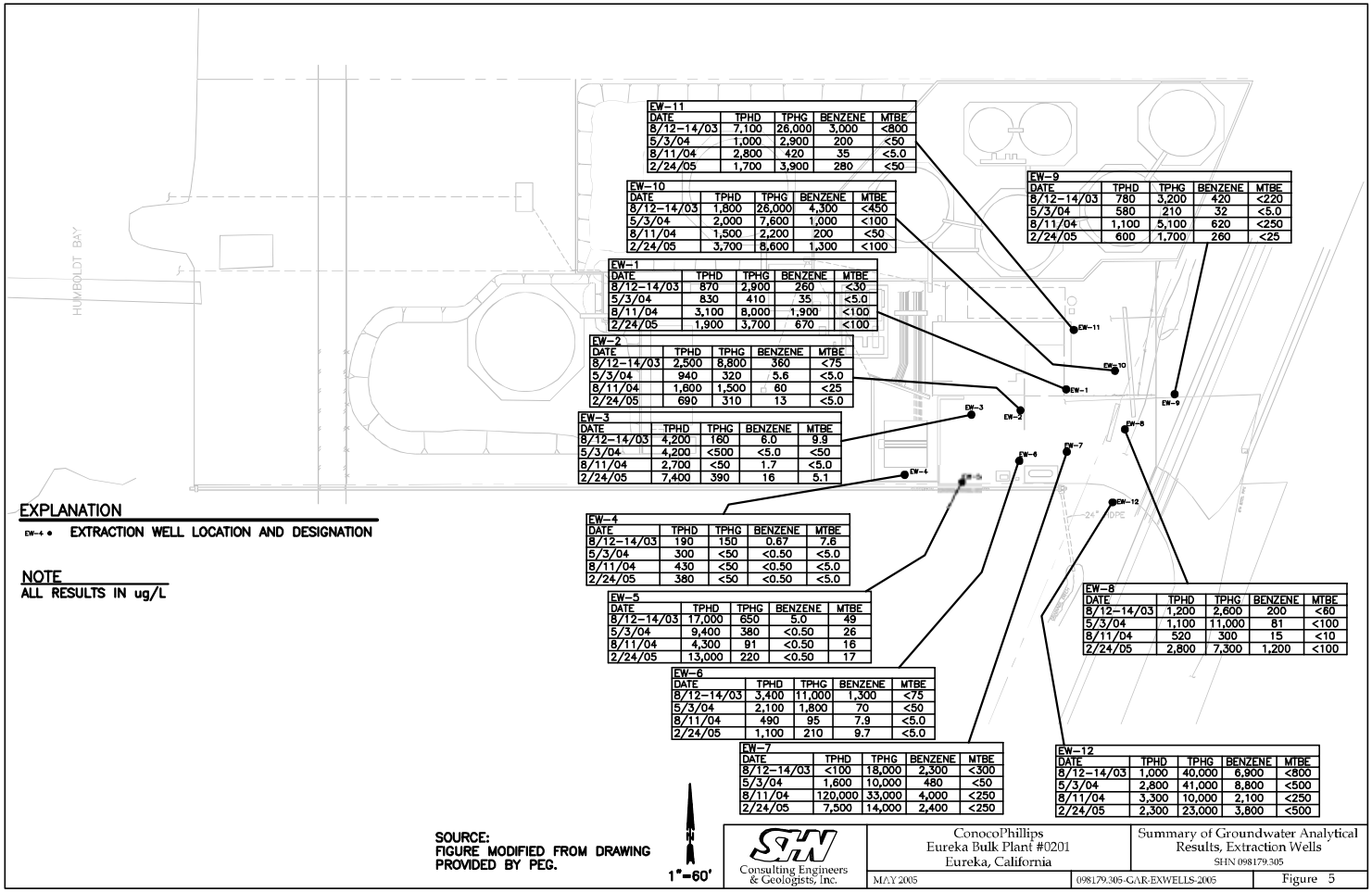
OUT OF SERVICE TERMINAL FACILITY
OPERATING BULK PLANT BOUNDARY
BIOSPARGE WELL LOCATION AND DESIGNATION
DEEP SOIL BORING LOCATION AND DESIGNATION
EXTRACTION WELL LOCATION AND DESIGNATION
NS NOT SAMPLED
FP FREE PRODUCT PRESENT
NA NOT ANALYZED
SOURCE:
FIGURE MODIFIED FROM DRAWING PROVIDED BY PEG.
SHN
Consulting Engineers & Geologists, Inc.
ConocoPhillips
Eureka Bulk Plant #0201
Eureka, California
Summary of Groundwater Anlytical Results, Monitoring Wells
SHN 098179.305
MAY 2005
098179.305-GAR-MWELLS-05
Figure 4



EW-11

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	7,100	26,000	3,000	<800
5/3/04	1,000	2,900	200	<50
8/11/04	2,800	420	35	<5.0
2/24/05	1,700	3,900	280	<50

EW-10

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	1,800	26,000	4,300	<450
5/3/04	2,000	7,600	1,000	<100
8/11/04	1,500	2,200	200	<50
2/24/05	3,700	8,600	1,300	<100

EW-9

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	780	3,200	420	<220
5/3/04	580	210	32	<5.0
8/11/04	1,100	5,100	620	<250
2/24/05	600	1,700	260	<25

EW-1

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	870	2,900	260	<30
5/3/04	830	410	35	<5.0
8/11/04	3,100	8,000	1,900	<100
2/24/05	1,900	3,700	670	<100

EW-2

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	2,500	8,800	360	<75
5/3/04	940	320	5.6	<5.0
8/11/04	1,600	1,500	60	<25
2/24/05	690	310	13	<5.0

EW-3

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	4,200	160	6.0	9.9
5/3/04	4,200	<500	<5.0	<50
8/11/04	2,700	<50	1.7	<5.0
2/24/05	7,400	390	16	5.1

EW-4

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	190	150	0.67	7.6
5/3/04	300	<50	<0.50	<5.0
8/11/04	430	<50	<0.50	<5.0
2/24/05	380	<50	<0.50	<5.0

EW-5

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	17,000	650	5.0	49
5/3/04	9,400	380	<0.50	26
8/11/04	4,300	91	<0.50	16
2/24/05	13,000	220	<0.50	17

EW-6

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	3,400	11,000	1,300	<75
5/3/04	2,100	1,800	70	<50
8/11/04	490	95	7.9	<5.0
2/24/05	1,100	210	9.7	<5.0

EW-7

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	<100	18,000	2,300	<300
5/3/04	1,600	10,000	480	<50
8/11/04	120,000	33,000	4,000	<250
2/24/05	7,500	14,000	2,400	<250

EW-8

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	1,200	2,600	200	<60
5/3/04	1,100	11,000	81	<100
8/11/04	520	300	15	<10
2/24/05	2,800	7,300	1,200	<100

EW-12

DATE	TPHD	TPHG	BENZENE	MTBE
8/12-14/03	1,000	40,000	6,900	<800
5/3/04	2,800	41,000	8,800	<500
8/11/04	3,300	10,000	2,100	<250
2/24/05	2,300	23,000	3,800	<500

EXPLANATION

EW-4 • EXTRACTION WELL LOCATION AND DESIGNATION

NOTE

ALL RESULTS IN ug/L

SOURCE:
FIGURE MODIFIED FROM DRAWING PROVIDED BY PEG.

N

1"=60'

SHN Consulting Engineers & Geologists, Inc.

ConocoPhillips
Eureka Bulk Plant #0201
Eureka, California

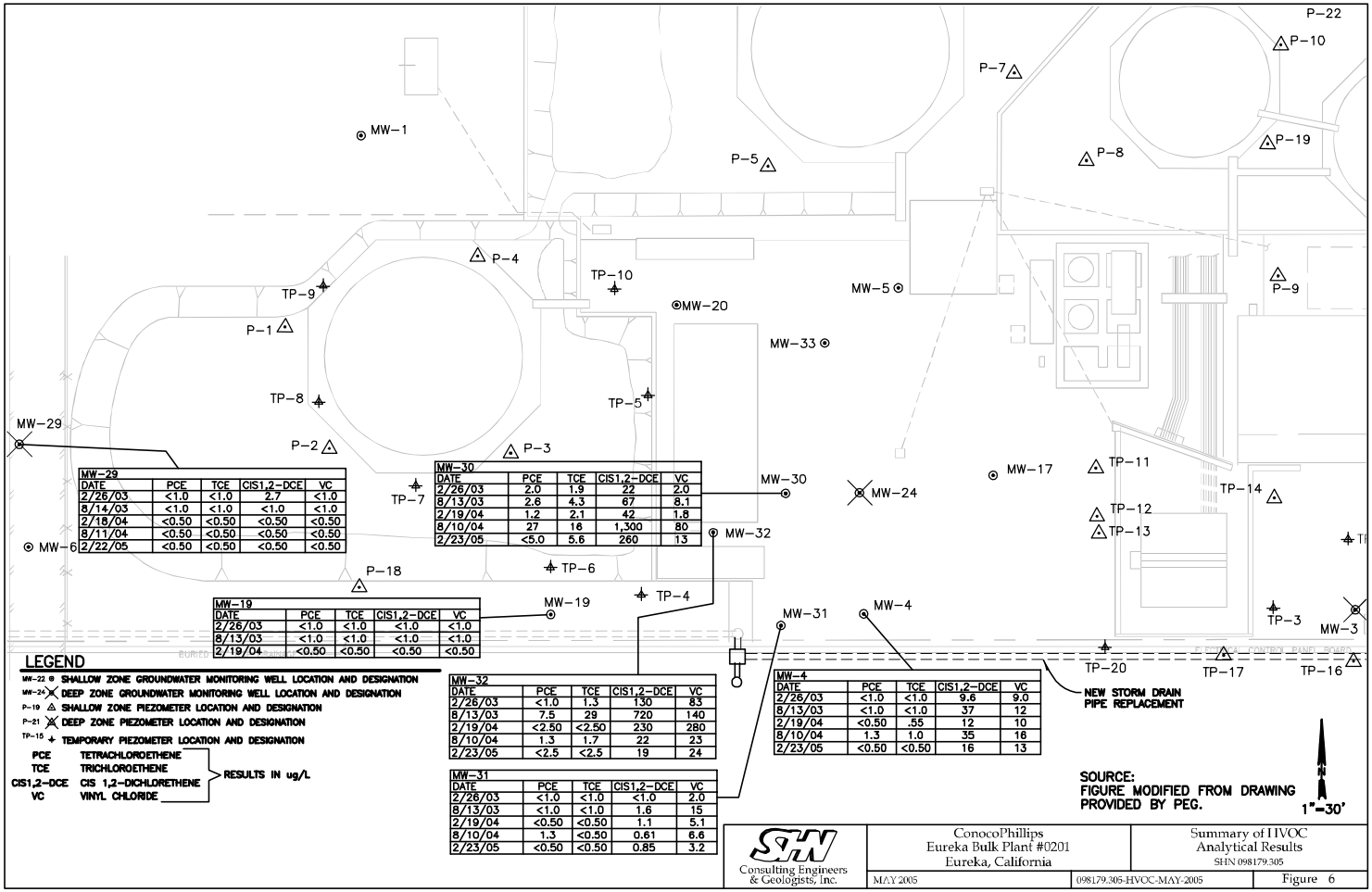
Summary of Groundwater Analytical Results, Extraction Wells
SHN 098179.305

MAY 2005 | 098179.305-GAR-EXWELLS-2005 | Figure 5

Table 2
Groundwater Monitoring Results for Petroleum Hydrocarbons, First Half 2005
Eureka Bulk Plant #0201
(in ug/L)[1]

Sample Location	Sample Date	TPHD[2]	TPHG[3]	B[3]	T[3]	E[3]	X[3]	MTBE[3]
MW-1	2/22/05	58	NA[4]	NA	NA	NA	NA	NA
MW-2	2/22/05	<50[5]	NA	NA	NA	NA	NA	NA
MW-3	2/23/05	5,000	280	0.87	<0.50	<0.50	1.2	19
MW-4	2/23/05	580	<50	NA	NA	NA	NA	NA
MW-5	2/23/05	2,300	<50	NA	NA	NA	NA	NA
MW-7	2/22/05	1,300	84	NA	NA	NA	NA	NA
MW-13	2/24/05	180	NA	NA	NA	NA	NA	NA
MW-15	2/24/05	NA	<50	<0.50	<0.50	<0.50	<0.50	<5.0
MW-17	2/23/05	3,300	130	16	<0.50	<0.50	<0.50	<5.0
MW-19	2/23/05	100	NA	NA	NA	NA	NA	NA
MW-20	2/22/05	350	NA	NA	NA	NA	NA	NA
MW-22	2/22/05	140	NA	NA	NA	NA	NA	NA
MW-24	2/22/05	<50	<50	NA	NA	NA	NA	NA
MW-25	2/24/05	190	NA	NA	NA	NA	NA	NA
MW-26	2/24/05	3,700	4,500	750	<5.0	98	94	<50
MW-27	2/24/05	6,100	4,300	1,000	<10	77	220	<100
MW-29	2/22/05	<50	<50	<0.50	<0.50	<0.50	<0.50	<5.0
MW-31	2/23/05	440	NA	NA	NA	NA	NA	NA
MW-32	2/23/05	1,400	51	NA	NA	NA	NA	<5.0
MW-33	2/23/05	230	NA	NA	NA	NA	NA	NA
MW-34	2/23/05	2,500	380	2.6	<0.50	1.5	1.3	<5.0
EW-1	2/24/05	1,900	3,700	670	<10	170	350	<100
EW-2	2/24/05	690	310	13	<0.50	<0.50	5.7	<5.0
EW-3	2/24/05	7,400	390	16	<0.50	<0.50	1.2	5.1
EW-4	2/24/05	380	<50	<0.50	<0.50	<0.50	<0.50	<5.0
EW-5	2/24/05	13,000	220	<0.50	<0.50	<0.50	<0.50	17
EW-6	2/24/05	1,100	210	9.7	<0.50	<0.50	0.95	<5.0
EW-7	2/24/05	7,500	14,000	2,400	330	690	1,700	<250
EW-8	2/24/05	2,800	7,300	1,200	110	290	740	<100
EW-9	2/24/05	600	1,700	260	25	36	130	<25
EW-10	2/24/05	3,700	8,600	1,300	260	440	1,500	<100
EW-11	2/24/05	1,700	3,900	280	60	83	430	<50
EW-12	2/24/05	2,300	23,000	3,800	450	900	3,000	<500

1. ug/L: micrograms per Liter
2. TPHD: Total Petroleum Hydrocarbons as Diesel, analyzed in general accordance with EPA Method Nos. 3510/8015B.
3. Total Petroleum Hydrocarbon as Gasoline (TPHG); Benzene (B); Toluene (T); Ethylbenzene (E); total Xylenes (X); and, Methyl Tertiary-Butyl Ether (MTBE), analyzed in general accordance with EPA Method. Nos. 8015M/8021B.
4. NA: Not Analyzed
5. <: Denotes a value that is "less than" the method detection limit.



MW-29				
DATE	PCE	TCE	CIS1,2-DCE	VC
2/26/03	<1.0	<1.0	2.7	<1.0
8/14/03	<1.0	<1.0	<1.0	<1.0
2/18/04	<0.50	<0.50	<0.50	<0.50
8/11/04	<0.50	<0.50	<0.50	<0.50
2/22/05	<0.50	<0.50	<0.50	<0.50

MW-30				
DATE	PCE	TCE	CIS1,2-DCE	VC
2/26/03	2.0	1.9	22	2.0
8/13/03	2.6	4.3	67	8.1
2/19/04	1.2	2.1	42	1.8
8/10/04	27	16	1,300	80
2/23/05	<5.0	5.6	260	13

MW-19				
DATE	PCE	TCE	CIS1,2-DCE	VC
2/26/03	<1.0	<1.0	<1.0	<1.0
8/13/03	<1.0	<1.0	<1.0	<1.0
2/19/04	<0.50	<0.50	<0.50	<0.50

MW-32				
DATE	PCE	TCE	CIS1,2-DCE	VC
2/26/03	<1.0	1.3	130	83
8/13/03	7.5	29	720	140
2/19/04	<2.50	<2.50	230	280
8/10/04	1.3	1.7	22	23
2/23/05	<2.5	<2.5	19	24

MW-31				
DATE	PCE	TCE	CIS1,2-DCE	VC
2/26/03	<1.0	<1.0	<1.0	2.0
8/13/03	<1.0	<1.0	1.6	15
2/19/04	<0.50	<0.50	1.1	5.1
8/10/04	1.3	<0.50	0.61	6.6
2/23/05	<0.50	<0.50	0.85	3.2

MW-4				
DATE	PCE	TCE	CIS1,2-DCE	VC
2/26/03	<1.0	<1.0	9.6	9.0
8/13/03	<1.0	<1.0	37	12
2/19/04	<0.50	.55	12	10
8/10/04	1.3	1.0	35	16
2/23/05	<0.50	<0.50	16	13

LEGEND

- MW-22 ⊙ SHALLOW ZONE GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- MW-24 ⊗ DEEP ZONE GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- P-19 △ SHALLOW ZONE PIEZOMETER LOCATION AND DESIGNATION
- P-21 ⊗ DEEP ZONE PIEZOMETER LOCATION AND DESIGNATION
- TP-15 + TEMPORARY PIEZOMETER LOCATION AND DESIGNATION

RESULTS IN ug/L:
- PCE TETRACHLOROETHENE
- TCE TRICHLOROETHENE
- CIS1,2-DCE CIS 1,2-DICHLORETHENE
- VC VINYL CHLORIDE

Consulting Engineers & Geologists, Inc.

ConocoPhillips
Eureka Bulk Plant #0201
Eureka, California

Summary of HVOC Analytical Results
SHN 098179.305

MAY 2005 | 098179.305-HVOC-MAY-2005 | Figure 6

3.6 HVOCs Groundwater Monitoring Results

Analytical results for HVOCs in groundwater are summarized in Table 3 and shown on Figure 6. Historic analytical results for HVOCs are presented in Appendix E.

Table 3
Groundwater Monitoring Results for HVOCs, First Half 2005
Eureka Bulk Plant #0201
(in ug/L)[1]

Sample Location	Sample Date	PCE[2]	TCE[3]	cis 1,2-DCE[4]	trans 1,2-DCE[5]	Chloroform	Vinyl Chloride
MW-4	2/23/05	<0.50[6]	<0.50	16	0.77	<0.50	13
MW-29	2/22/05	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
MW-30	2/23/05	<5.0	5.6	260	<5.0	<5.0	13
MW-31	2/23/05	<0.50	<0.50	0.85	<0.50	<0.50	3.2
MW-32	2/23/05	<2.5	<2.5	19	<2.5	<2.5	24

1. ug/L: microgram per Liter
2. PCE: Tetrachloroethene
3. TCE: Trichloroethene
4. cis-1,2-DCE: cis-1,2-Dichloroethene
5. trans-1,2-DCE: trans-1,2-Dichloroethene
6. <: Denotes a value that is "less than" the method detection limit.

Tetrachloroethene (PCE) was a solvent historically used at the site and is the parent HVOC contaminant with degradation products (in order of sequential reductive dechlorination) Trichloroethene (TCE), cis-1,2-dichloroethene (DCE), and Vinyl Chloride (VC). Additional degradation products include trans 1,2-dichloroethene (trans 1,2-DCE) and 1,1-DCE. The products DCE and VC degrade aerobically, therefore bio-sparging in this area has been conducted to promote aerobic biodegradation of these daughter products.

3.7 Groundwater Field-Measured Parameter Results

The groundwater field-measured parameter results from the February 2005 monitoring event are summarized in Table 4. Monitoring for field parameters is limited to semiannual monitoring only for Dissolved Oxygen (DO), Dissolved Carbon Dioxide (DCO_2), and Oxidation-Reduction Potential (ORP), which are measured in the field using portable instrumentation on selected monitoring wells. This data are collected to monitor the effectiveness of the biosparge system. The data in Table 4 indicate biodegradation is occurring; however, there is limited dissolved oxygen in monitoring wells MW-4, MW-30, MW-31, and MW-32. The western biosparge system, which includes biosparge wells BS-1 through BS-18 and two biovent trenches, is cycled between four separate zones weekly to elevate dissolved oxygen levels in the groundwater.

Table 4
Groundwater Field-Measured Parameters, February, 2005
Eureka Bulk Plant #0201

Sample Location	DO[1] (ppm)	DCO_2[1] (ppm)[2]	ORP[1] (mV)[3]
MW-4	0.68	35	112
MW-5	1.01	45	128
MW-19	3.23	40	90
MW-30	0.65	30	106
MW-31	0.67	50	104
MW-32	0.74	160	-60
MW-33	3.25	30	111

1. DO: Dissolved Oxygen, DCO_2: Dissolved Carbon Dioxide, ORP: Oxidation-Reduction Potential, and pH measured with portable equipment.
2. ppm: parts per million
3. mV: millivolts

4.0 Separate Phase Hydrocarbon Monitoring Program

4.1 SPH Recovery Program

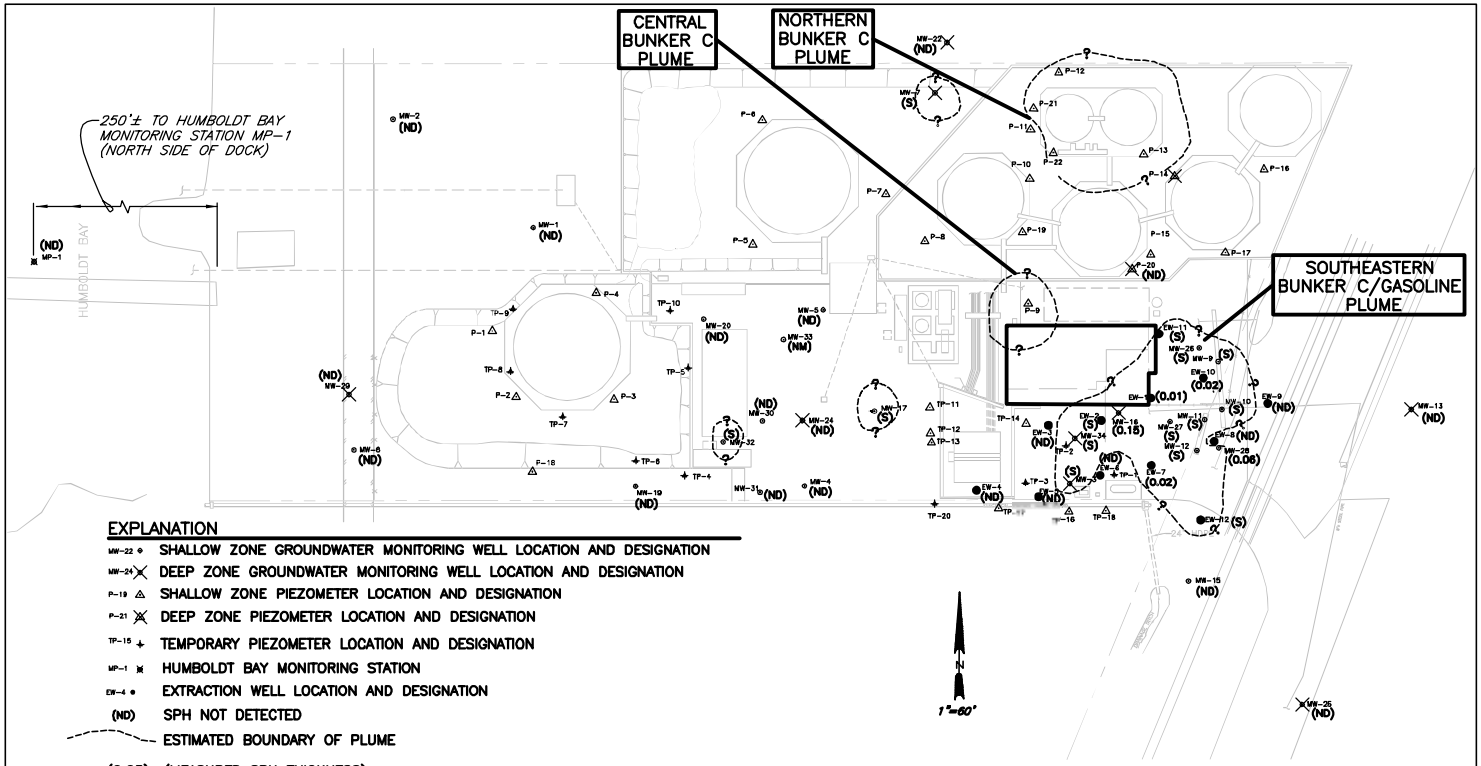
SHN is performing the semi-monthly SPH recovery program. SPH remediation is through extraction, and absorbent socks. SHN performed semi-monthly SPH removal site visits in January through June 2005. Field reports are presented in Appendix B.

4.2 SPH Monitoring Results

The semiannual SPH monitoring well gauging program included monitoring of SPH thickness at 43 monitoring points. Of the 43 points monitored, SPH was observed in 19. SPH thickness measurements are presented in Appendix B, and shown in Figure 7. Currently, only the southeastern Bunker C / Gasoline plume is monitored. The northern Bunker C plume and the central Bunker C plume have remained stable since 1997 and are no longer monitored.

4.3 Waste Handling

During this reporting period, the spent Granular Activated Carbon (GAC) used to treat the vapor effluent from the air stripper was transported off-site and replaced with new GAC pellets by U.S. Filter Westates. Disposal Certificates are included in Appendix B. The free product tank of the DPE system collects SPH removed from extraction wells MW-26, MW-27, and MW-28. SPH in the free product tank of the DPE system is stored under vacuum, which allows the SPH to evaporate and be oxidized by the thermal oxidizer (burner) of the DPE system. This method greatly reduces the quantity of waste requiring off-site disposal.



SOURCE:
FIGURE MODIFIED FROM DRAWING PROVIDED BY PEG.

SHN Consulting Engineers & Geologists, Inc.	ConocoPhillips Eureka Bulk Plant #0201 Eureka, California	Extent of SPH Map February 21, 2005 SHN 098179.305
	May, 2005	098179.305-SPH-FEB-05	Figure 7

5.0 Remediation Monitoring Program

5.1 Eastern Biovent/Biosparge System

The Eastern Biovent/Biosparge System, located near MW-9, was repaired and placed into service on August 2, 1999. SHN modified the plumbing on December 23, 1999 to change the location of airflow from the lower region to the upper region. SHN modified and expanded the Eastern Biovent/Biosparge System on May 5, 2003 to allow introduction of air into three different areas. Trench #1A is pre-existing piping that permits bioventing, Trench #1B is pre-existing piping that permits biosparging, and Trench #2 is approximately 45 feet of newly-installed piping that permits bioventing (Figure 2). Table 5 presents the air injection location, injection pressure, temperature, flow rate, and hours of operation for the first half of 2005. Biovent/Biosparge field data sheets are included in Appendix B.

On July 31, 2000, the system timer was set to operate 10 hours on and 2 hours off. On June 19, 2001, the timer was reset to operate in a pulsed mode; 2 hours on, then 2 hours off. On March 9, 2004, the system timer was reset to operate the blower on a continuous basis to prevent fluctuations of the groundwater mounding in the vicinity of the dual phase system extraction wells.

Maintenance and repairs conducted on the eastern biovent/biosparge system are as follows:

- cleaned or replaced the air filter as required.

Table 5
Biovent/Biosparge System East Monitoring Results, First Half, 2005
Eureka Bulk Plant #0201

Date	Injection Areas and Valve Position	Mode	Pressure (psi)[1]	Temperature (°F)[2]	Flow Velocity (ft/min)[3]	Flow Rate (cfm)[4]	Operation Time (hours)
12/30/04	Trench #1B	Sparge	3.0	147.7	12,591	293	41,715
1/7/05	Trench #1B	Sparge	3.0	145.3	9,880	230	41,903
1/14/05	Trench #1B	Sparge	3.0	149.1	10,810	252	NM
1/21/05	Trench #1B	Sparge	3.0	135.4	10,725	250	42,239
1/28/05	Trench #1B	Sparge	2.5	127.9	11,932	278	42,407
2/4/05	Trench #1B	Sparge	2.25	129.1	12,348	288	42,575
2/11/05	Trench #1B	Sparge	2.0	127.0	12,110	282	42,745
2/18/05	Trench #1B	Sparge	2.0	126.6	14,154	330	42,911
2/25/05	Trench #1B	Sparge	2.0	123.2	12,075	281	43,078
3/4/05	Trench #1B	Sparge	2.1	126.6	13,400	312	43,244
3/11/05	Trench #1B	Sparge	1.75	120.5	12,610	294	43,411
3/18/05	Trench #1B	Sparge	2.0	121.6	11,750	274	43,579
3/25/05	Trench #1B	Sparge	3.0	142.6	11,180	260	43,748
4/1/05	Trench #1B	Sparge	3.0	143.9	11,025	257	43,915
4/8/05	Trench #1B	Sparge	3.0	148.2	10,125	236	44,083
4/15/05	Trench #1B	Sparge	3.0	NM	11,295	263	NM
4/22/05	System Off Line						

Table 5
Biovent/Biosparge System East Monitoring Results, First Half, 2005
Eureka Bulk Plant #0201

Date	Injection Areas and Valve Position	Mode	Pressure (psi)[1]	Temperature (°F)[2]	Flow Velocity (ft/min)[3]	Flow Rate (cfm)[4]	Operation Time (hours)
4/29/05	Trench #1B	Sparge	2.25	128.8	11,080	258	NM
5/5/05	Trench #1B	Sparge	2.0	122.5	11,460	267	44,541
5/12/05	Trench #1B	Sparge	2.25	NM	11,526	269	44,709
5/20/05	Trench #1B	Sparge	2.0	134.4	12,620	294	NM
5/27/05	Trench #1B	Sparge	2.0	129.9	14,056	328	NM
6/3/05	Trench #1B	Sparge	1.75	119.4	11,680	272	NM
6/9/05	Trench #1B	Sparge	2.0	125.9	12,600	294	45,384
6/24/05	Trench #1B	Sparge	2.0	128.8	11,295	263	45,742

1. psi: pounds per square inch; 1 psi = 27.7 inches of water
2. °F: degrees Fahrenheit
3. ft/min: feet per minute
4. cfm: 0.0233 ft^2 x velocity (ft/min) = cfm through a 2" I.D. pipe
5. NM: Not Measured

5.2 Western Biovent/Biosparge System

The Western Biovent/Biosparge System, located near MW-5, has been operating since start up on June 14, 1999. In January 2003, the timer was reset to operate in a pulsed mode; 2 hours on, then 2 hours off. This was done to optimize operation of the blower and minimize the establishment of preferential airflow pathways in the vadose zone. SHN modified and expanded the Western Biovent/Biosparge System during January 2003 to allow introduction of air into four different areas. BS-1 thru BS-10 are pre-existing sparge wells that permits biosparging, Trench #1 is pre-existing piping that permits biosparging into a gravel pit, BS-11 thru BS-18 are newly-installed sparge wells that permit biosparging, and Trench #2 is approximately 120 feet of newly-installed piping that permits bioventing. Table 6 presents the air injection location, injection pressure, temperature, flow rate, and hours of operation for the first half of 2005. Biovent/biosparge field data sheets are included in Appendix B.

Maintenance and repairs conducted on the western biovent/biosparge system are as follows:

- lubricated the motor as required, and
- cleaned or replaced the air filter as required.

Table 6
Biovent/Biosparge System West Monitoring Results, First Half, 2005
Eureka Bulk Plant #0201

Date	Injection Areas and Valve Position	Mode	Pressure (psi)[1]	Temperature (°F)[2]	Flow Rate (cfm)[3]	Operation Time (hours)
12/30/04	Trench #2 – 100% Open	Vent	7.5	100	35	NM
1/7/05	Trench #2 – 100% Open	Vent	2.25	100	68	5225
1/14/05	BS-11 through BS-18 – 100% Open Trench #2 – 10% Open	Vent and sparge	6.0	104	37	NM
1/21/05	Trench #1 – 100% Open	Vent	2.0	140	68	NM
1/28/05	Trench #2 – 100% Open	Vent	1.75	90	72	NM
2/3/05	BS-11 through BS-18 – 100% Open Trench #2 – 10% Open	Vent and sparge	~ 8.0	99	32	NM
2/11/05	Trench #1 – 100% Open	Vent	1.75	135	70	NM
2/18/05	Trench #2 – 100% Open	Vent	1.5	103	53	NM
2/25/05	BS-11 through BS-18 – 100% Open Trench #1 – 10% Open	Vent and sparge	8.0	105	43	NM
3/4/05	Trench #1 – 100% Open	Vent	1.80	140	67	NM
3/11/05	Trench #2 – 100% Open	Vent	1.4	96	70	NM
3/18/05	BS-1 through BS-10 100% Open	Sparge	6.5	110	47	NM
3/25/05	BS-11 through BS-18 – 100% Open	Sparge	8.25	115	40	NM
4/1/05	Trench #1 – 100% Open	Vent	1.75	140	67	NM
4/8/05	Trench #2 – 100% Open	Vent	2.25	73	72	NM
4/15/05	BS-1 through BS-10 100% Open	Sparge	6.75	100	50	NM
4/22/05	System Off Line					
4/29/05	BS-11 through BS-18 – 100% Open Trench #1 – 10% Open	Vent and sparge	8.25	130	42	NM
5/5/05	Trench #1 – 100% Open	Vent	1.75	145	68	NM
5/12/05	Trench #2 – 100% Open	Vent	1.5	104	70	NM
5/20/05	BS-11 through BS-18 – 100% Open Trench #1 – 50% Open	Vent and sparge	7.25	136	40	NM
5/27/05	BS-1 through BS-10 100% Open	Sparge	6.5	120	50	NM
6/3/05	BS-11 through BS-18 – 100% Open Trench #1 – 10% Open	Vent and sparge	8.25	150	42	NM
6/9/05	BS-1 through BS-10 100% Open	Sparge	6.75	160	50	6910
6/24/05	BS-11 through BS-18 – 100% Open Trench #1 – 10% Open	Vent and sparge	8.5	184	39	NM

1. psi: pounds per square inch; 1 psi = 27.7 inches of water
2. °F: degrees Fahrenheit
3. cfm: cubic feet per minute
4. NM: Not Measured

Percent oxygen, carbon dioxide, and Volatile Organic Compounds (VOCs) were measured in monitoring wells and extraction wells in the vicinity of the biosparge wells and the bioventing trenches to monitor the effectiveness of both systems. Results of the monitoring are presented in Table 7. Field data are included in Appendix B.

Areas of elevated oxygen concentrations and high soil vapor concentrations (as measured with the Photoionization Detector [PID]) are being influenced by bioventing, but still have a source that is contributing to soil vapor concentrations. Areas of low oxygen concentrations and elevated soil vapor concentrations are not being appreciably influenced by bioventing. Areas of elevated oxygen concentrations and low soil vapor concentrations are being influenced by bioventing, but do not have significant source.

Table 7
Oxygen, Carbon Dioxide, and PID Soil Vapor Measurements, February, 2005
Eureka Bulk Plant #0201

Sample Location	Oxygen[1] %	Carbon Dioxide[1] %	PID[1] (ppm)[2]
MW-4	19.1	1.6	280
MW-5	12.0	5.2	660
MW-9	20.9	0	0
MW-10	20.9	0	0
MW-11	20.9	0	0
MW-12	20.9	0	0
MW-19	15.1	5.9	460
MW-20	20.8	1.2	240
MW-26	8.3	8.8	79% LEL[3]
MW-27	10.3	5.8	81% LEL
MW-28	-0.4	19.2	9% LEL
MW-30	18.9	3.3	540
MW-31	20.1	0.4	280
MW-32	11.8	4.1	460
MW-33	18.8	2.8	560
MW-34	3.5	12.3	840
EW-1	20.5	0.4	50% LEL
EW-2	13.5	3.5	8,960
EW-3	15.0	6.7	620
EW-4	20.9	0.4	120
EW-5	4.5	9.0	1,620
EW-6	16.8	3.4	880
EW-7	-0.5	16.7	8% LEL
EW-8	Well On-Line		
EW-9	Well On-Line		
EW-10	14.8	3.3	93% LEL
EW-11	18.4	1.0	33% LEL
EW-12	0.1	12.0	9% LEL

1. PID: Photoionization Detector
2. ppm: parts per million
3. %LEL: percent of Lower Explosive Limit

4.3 Dual-Phase Extraction (DPE) System

The DPE system operated during most of the first half of 2005, with a few temporary shutdowns primarily due to high groundwater conditions and disconnection of utilities to the system. Appendix B contains the DPE system monitoring sheets.

During the first half of 2005, the DPE system extracted 1.3 million gallons of a SPH / groundwater mixture from the site and, to date, approximately 8.3 million gallons of a SPH / groundwater mixture have been extracted. The mass of TPH removed through groundwater extraction during the first half of 2005 was 173 pounds and, to date, a total of 456 pounds of TPH have been removed. The mass of TPHG removed in the vapor phase during the first half of 2005 was 259 pounds and to date a total of 1,771 pounds of TPHG in the vapor phase have been removed.

Maintenance, modifications, and repairs conducted on the DPE system are as follows:

- The supplemental fuel valves were adjusted to reduce the quantity of fuel required to maintain proper thermal oxidizer operating temperatures.
- Replaced O-ring on water flow meter on the air / water-metering loop.
- The air stripper and discharge line were cleaned, as required.
- Restarted system, as required.
- The sight-tube of water knockout tank was cleaned.
- The check-valves of the water discharge piping were cleaned.
- The air intake filters were cleaned, as required.
- The storage media of the chart recorder required for compliance monitoring was replaced, as needed.
- Emulsion was removed from the air stripper as required with the free product extraction hose.
- A pump test was conducted on the water discharge pump.
- The granular activated carbon was changed out.
- The manifold of the water-metering loop was cleaned.
- Motors were lubricated, as required.
- Replaced the water level sensor of the water knockout pot.
- Added oil to Liquid Ring Pump, as required.

4.4 Compliance Monitoring

The City of Eureka and the North Coast Unified Air Quality Management District (NCUAQMD) regulate emissions from the DPE system. Water discharged is sampled and analyzed to assure it meets the Specific Pollutant Limitations set forth by City of Eureka's Sewer Use Permit # 84. Samples identified as EX-EFF are samples collected from the discharge of the DPE system (influent to the air stripper). Samples identified as AS-EFF are samples collected from the discharge of the air stripper (effluent from air stripper). All water is discharged from the outlet of the air stripper. The results of the water sampling events during the first half of 2005 were in compliance with the

City of Eureka's Sewer Use Permit # 84, except the sample collected on February 25, 2005. A subsequent sample was collected on March 18, 2005, and was found to be in compliance with the City of Eureka's Sewer Use Permit. The results of the sampling events are presented in Table 8. The laboratory analytical results are in Appendix C.

Table 8
Dual-Phase Extraction Water Discharge Analytical Results, First Half 2005
ConocoPhillips, Bulk Plant #0201, Eureka, California
(in ug/L)[1]

Sample ID	Date	TPHG[2]	TPHD[3]	TPHMO[3]	Benzene[4]	Toluene[4]	Ethyl-benzene[4]	Total Xylenes[4]	MTBE[4]
EX-EFF	12/17/04	13,000	2,000	NA	24	12	41	140	<2.5
AS-EFF		17,000	1,400	NA[5]	<5.0[6]	<5.0	<5.0	<10	<5.0
EX-EFF	1/14/05	17,000	7,200	NA	54	26	100	340	<10
AS-EFF		3,700	7,800	NA	<1.0	1.2	24	<2.0	<1.0
EX-EFF	2/25/05	18,000	13,000	NA	360	120	440	1,400	<50
AS-EFF		87,000	24,000	NA	3.5	1.8	19	78	<25
EX-EFF	3/18/05	540	540	NA	2.9	0.61	1.8	6.3	<0.50
AS-EFF		73	580	NA	<0.50	<0.50	<0.50	<1.0	<0.50
AS-EFF	3/28/05	<50	130	<170	<0.50	<0.50	<0.50	<1.0	<3.0
EX-EFF	4/29/05	180	530	<500	2.0	<0.50	1.5	4.6	<0.50
AS-EFF		<50	590	<500	<0.50	<0.50	<0.50	<1.0	<0.50E
EX-EFF	5/27/05	340	260	<500	12	1.9	3.9	12	<.050
AS-EFF		100	260	<500	<0.50	<0.50	<0.50	<1.0	<0.50
EX-EFF	6/09/05	5,900	16,000	12,000	11	3.4	27	72	<0.50
AS-EFF		18,000	3,900	2,400	<0.50	<05.0	6.7	15	<25
Specific Pollutant Limitations[7]		TPH[8] 25,000			119	376	70	267	None

1. ug/L: micrograms per Liter
2. Total Petroleum Hydrocarbon as Gasoline (TPHG), analyzed in general accordance with EPA Method Nos. 5030/GCFID (LUFT) or 8260B.
3. Total Petroleum Hydrocarbon as Diesel (TPHD) and Total Petroleum Hydrocarbons as Motor Oil (TPHMO), analyzed in general accordance with EPA Method No. 3510/GCFID (LUFT) or 8015M.
4. Benzene, Toluene, Ethylbenzene, and total Xylenes (BTEX), and Methyl Tertiary-Butyl Ether (MTBE), analyzed in general accordance with EPA Method Nos. 5030/8021B or 8260B.
5. NA: Not Analyzed
6. <: Denotes a value that is "less than" the method detection limit.
7. Specific pollutant specification, as set forth by the City of Eureka, Reference: 1997 Eureka Municipal Code, Title 5, Chapter 50 Sewers, Sections 50.021& 50.022.
8. Total Petroleum Hydrocarbon approximately equals TPHG Concentration plus TPHD Concentration plus TPHMO concentration.

The DPE system discharges all extracted groundwater to the City of Eureka's sanitary sewer under permit # 84. Water discharged from the DPE system is processed through an air stripper before being discharged to the sanitary sewer. Monthly samples are collected from the water effluent of the DPE system and the air stripper. The sampling event conducted during December 2004 is included in this monitoring report.

Vapors discharged from the DPE system are sampled and analyzed to assure they meet the limitations set forth by the NCUAQMD's Permit # NX-065. Vapors are discharged from the thermal oxidizer and the air stripper. The thermal oxidizer discharges vapors extracted from the soil and vapors stripped from the groundwater in the extraction lines. The air stripper discharges vapors generated during the stripping of the groundwater prior to being discharged to the sanitary sewer. Vapors from the air stripper are passed through two carbon beds prior to discharge to the atmosphere. The results of the vapor compliance monitoring are presented in Table 9. The laboratory analytical results are in Appendix C. Samples identified as EXS EFF are samples collected from the vapor emissions of the thermal oxidizer. Samples identified as CAR EFF and AS EFF are emissions from the final carbon bed. Samples identified as EXS-INF are samples collected from the DPE system prior to thermal distribution and are not related to compliance monitoring. All the results of the vapor sampling events during the first half of 2005 were in compliance with NCUAQMD's Permit # NX-065. The sampling event conducted during December of 2004 is included in this first half of 2005 monitoring report. Samples collected on June 24, 2005 shall be included in the second half of 2005 report.

Table 9
Vapor Emission Analytical Results, First Half 2005
ConocoPhillips, Bulk Plant # 0201, Eureka, California
(in ppmV)[1]

Sample ID	Date	TPHG[2]	Benzene[3]	Vinyl Chloride[3]	Trichloro-ethene[3]	Tetrachloro-ethene[3]	Methylene Chloride[3]
EXS-INF	12/17/04	100	2.0	<0.016	<0.016	<0.016	<0.016
EXS-EFF		<0.500[4]	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
CAR-EFF		5.2	0.070	<0.0020	<0.0020	<0.0020	<0.0020
EXS-INF	1/14/05	120	1.1	<0.016	<0.016	<0.016	<0.016
EXS-EFF		1.0	0.080	<0.0020	<0.0020	<0.0020	<0.0020
CAR-EFF		8.2	0.110	<0.0020	<0.0020	<0.0020	<0.0020
EXS-INF	2/25/05	22.0	0.270	<0.0044	<0.0044	<0.0044	<0.0044
EXS-EFF		<0.500	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
CAR-EFF		4.30	0.097	<0.0020	<0.0020	<0.0020	<0.0020
EXS-INF	3/18/05	20.0	0.300	<0.0065	<0.0065	<0.0065	<0.0065
EXS-EFF		2.0	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
CAR-EFF		<0.500	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
EXS-INF	4/29/05	25.0	0.390	<0.0029	<0.0029	<0.0029	<0.0029
EXS-EFF		<0.500	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
CAR-EFF		<0.500	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
EXS-INF	5/27/05	83.0	1.1	<0.016	<0.016	<0.016	<0.016
EXS-EFF		<0.500	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
CAR-EFF		<0.500	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Discharge Limits[5]		30	See note 5	See note 5	See note 5	See note 5	See note 5

1. ppmV: parts per million by volume
2. TPHG: Total Petroleum Hydrocarbons as Gasoline, analyzed in accordance with EPA Method No. 21 TO-14A
3. Benzene and chlorinated compounds were analyzed in general accordance with EPA Method No. 21 TO-14A
4. <: Denotes a value that is "less than" the method detection limit
5. Discharge limits for benzene, vinyl chloride, trichloroethene, tetrachloroethene, and methyl chloride are limited to 1 pound per day.

6.0 Conclusions and Recommendations

Based on the work performed, SHN concludes that:

- Low concentrations of HVOCs were detected in shallow wells MW-4, MW-30, MW-31, and MW-32.
- The SPH Monitoring and Removal Program and the Biosparge / Biovent Monitoring Program are both operating efficiently.
- The DPE unit was online from January to June 2005, and approximately 1.3 million gallons of a SPH / groundwater mixture were removed, treated, and discharged to the City of Eureka's Wastewater Collection System.

Based on these conclusions, SHN recommends the following:

- Continue biosparging in the lower trench (Trench #1B) with the Eastern Biovent / Biosparge System.
- Continue bioventing and biosparging with the Western Biovent / Biosparge System, alternating weekly between BS-1 thru BS-10, BS-11 thru BS-18, Trench #1, and Trench #2.
- Conduct semi-monthly extraction of SPH from monitoring wells MW-26, MW-27, and MW-28 using the modified piping from the DPE System.
- Continue monitoring as outlined in (M&RP) No. R1-2004-0022.
- Continue to operate the DPE system.

7.0 References

SHN Consulting Engineers & Geologists, Inc. (May 16, 2000). "Report of Findings for Tidal Study and SPH Recovery Testing." Eureka: SHN.

Appendix A

Groundwater Monitoring Standard Operating Procedures for ConocoPhillips

ConocoPhillips
Eureka Bulk Terminal (Site ID #1THU463)
Groundwater Monitoring Standard Operational Procedure

A. Groundwater Monitoring Well Sampling

All monitoring wells are measured for depth to water, Separate Phase Hydrocarbons (SPH) thickness and total depth during each monitoring event. During the purging operations, Electrical Conductivity (EC), temperature, and pH are measured in each well, using portable instrumentation. Bioremediation parameters Dissolved Oxygen (DO), Dissolved Carbon Dioxide (DCO_2), and Oxidation-Reduction Potential (ORP) are measured in select monitoring wells upon completion of purging activities using a field test kit or portable instrumentation.

Following purging, a groundwater sample is collected from each well using a new, disposable polyethylene bailer. The samples are then transferred into laboratory-supplied bottles. Water samples are labeled, stored in an iced cooler, and transported to the designated analytical laboratory for analysis. The samples are transported, accompanied by the proper chain-of-custody documentation. Groundwater samples are analyzed for Total Petroleum Hydrocarbons as Gasoline (TPHG) and as Diesel (TPHD); Benzene, Toluene, Ethylbenzene, and total Xylenes (BTEX); Methyl Tertiary-Butyl Ether (MTBE); and Halogenated Volatile Organic Compounds (HVOCs) using the methods described in Section C.

Water or waste generated during the purging of the groundwater monitoring wells is placed in 55-gallon Department of Transportation-rated drums. All purge water is treated by the dual-phase extraction (DPE) system / air stripper prior to discharge to the City or Eureka wastewater treatment plant under sewer use permit #84, or disposed of by a licensed hazardous waste disposal company.

B. Bioremediation Monitoring Program

To monitor the effectiveness of the biosparge systems, the following indicators of intrinsic bioremediation are monitored in selected wells using portable instrumentation:

- DO
- DCO_2
- EC
- pH

In addition, groundwater samples from selected wells were historically analyzed for the following indicators of intrinsic bioremediation:

- Nitrate
- Sulfate
- Dissolved Iron
- Dissolved Methane
- Dissolved Ethane
- Dissolved Ethene
- Chloride

To demonstrate that bioremediation is occurring, there must be evidence: 1) of contaminant reduction, and 2) that the potential exists for bioremediation at the site. Item 2 is measured by the parameters listed above.

C. Laboratory Analysis

Water samples are analyzed for TPHG in accordance with U.S. Environmental Protection Agency (EPA) Method No. 5030 GC/FID, BTEX in accordance with EPA Method No. 602, MTBE in accordance with EPA Method No. 602, TPHD in accordance with EPA Method 3550 GC/FID, and HVOCs in accordance with EPA Method No. 8021B.

Historically, groundwater samples collected for indications of bioremediation were analyzed for soluble iron in accordance with EPA Method No. 200.7; nitrate, sulfate, and chloride in accordance with EPA Method No. 300; and soluble methane, ethene, and ethane in accordance with EPA Method No. 18 (GC/FID).